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REPORT ON THE FOURTH UNITED STATES TRIAL INSPECTION EXERCISE

Introduction

The United States government is continuing development of inspection procedures which will contribute to monitoring and verification measures for a Chemical Weapons Convention (CWC). In February 1989, United States experts conducted a National Trial Inspection (NTI) at the facility operated by Akzo Chemicals Inc., in Gallipolis Ferry, West Virginia. In March 1990, the United States conducted the second NTI at Alcolac Inc., in Baltimore, Maryland. Both of these exercises tested routine inspection procedures. The third NTI was a challenge inspection conducted in September 1990 at Monsanto Agricultural Company's Luling, Louisiana plant. The results of the first United States NTI were reported in CD/822, 22 June 1989. Results on the second NTI exercise were reported in CD/WP/WP.301, 27 June 1990. Results of the third NTI were reported in CD/1100, 14 August 1991.

The purpose of this fourth exercise was to conduct a challenge inspection in a sensitive undeclared government facility which included munition storage bunkers and warehouses. The inspection was conducted on 15-17 January 1991 at Redstone Arsenal, Huntsville, Alabama. It included assessment of production capability, inspection of various storage facilities for possible presence of CW materials, host/observer State simulation, escort simulation and assessment of all essential elements of a challenge inspection. The inspection started at the point of entry and simulated many of these activities by "table-top" exercises. This inspection did not include utilizing detection equipment or taking samples although these elements were considered and accounted for in a simulated manner.

The scenario for the challenge inspection was based on the allegation that Huntsville Arsenal and the Gulf Chemical Warfare Depot, once located at the present site of Redstone Arsenal, although not declared by the United States as CW facilities were, in fact, still engaged in CW production and storage. The Technical Secretariat was requested to confirm that

particularly worrisome because many of the World War II buildings do still exist although they have been converted to other uses, many of which are sensitive for national security reasons.

Under the challenge inspection protocol of the CWC, the challenged State is obliged to take appropriate steps to demonstrate its compliance with the CWC. The US policy is to fulfill the obligation without compromising national security considerations. In that regard, the approach of the home team was to address all the legitimate compliance concerns but to be tough negotiators in the process and to protect all sensitive sites.

The inspection team plan was to request a perimeter as near to the old production plants and storage areas as possible. Then, using a negotiated managed access, attempt to gain access to the former CW facilities to inspect and take samples if warranted. Recognizing that there were hundreds of storage buildings, a statistical sampling plan was employed to inspect a suitable number of storage areas to determine any relevance to the alleged violation. A tour of the site was also requested to inspect for CW characteristic facilities and subsequent negotiations were conducted to gain access to those facilities which could be used in prohibited CW activities.

A. GENERAL APPROACH

1. Objectives of the NTI

The main objectives of this challenge inspection were as follows:

- To gain experience for developing procedures which would facilitate determination of compliance with the CWC during a challenge inspection (CI).

- To determine if the site had the equipment and capability to produce Schedule 1 chemicals and whether CW weapons were stored there.

- To test our ability to adequately safeguard national security and proprietary information during a CI at a sensitive storage facility.

- To evaluate full-up and table-top exercises when performing the essential elements of a CI (notification, entry, etc.).

- To examine negotiation of a site perimeter and access within the perimeter as a means to alleviate concerns of the challenging State.

- To determine inspection manpower and costs of a CI.

- To determine the capabilities and physical constraints of an inspection team (associated with inspecting a storage site).

- To determine site manpower and training requirements necessary to accommodate a CI at a sensitive site.

2. **Provisions in the draft convention under which the NTI took place**

The NTI drew on the provisions governing challenge inspections as set forth in the Addendum to Annex 1, Protocol on Inspection Procedures, Part I and Part III contained in CD/1033.

3. **Type of on-site inspection**

The NTI was based on the challenge inspection of an undeclared facility.

4. **Advance Information**

In order to utilize the facilities of Redstone Arsenal, a control group formulated an understanding with Redstone on "what to expect" and "how to play" the exercise. Because it was a challenge of an undeclared facility, no facility agreement would be available. The inspection team was provided with advance site specific information, seven (7) days prior to the inspection.

5. **Type of facility inspected**

Redstone Arsenal is a large (about 32,000 acres) government-owned installation. It is the headquarters of US Army Missile Command (MICOM), the Marshall Space Flight Center, the Ordnance Missile and Munition Center and School, and numerous other tenant organizations. Morton-Thiokol Inc., also performs certain missile work for the Army in government-owned facilities located on the arsenal. In World War II, the installation was the location of Huntsville Arsenal, Redstone Ordnance Plant and the Gulf Chemical Warfare Depot. These three organizations were used for production of chemical agents, manufacture of chemical

ordnance, loading/assembly of ordnance, and storage and shipment of chemical weapons. Such activity ceased at the end of World War II, in 1945.

6. Type of activity at the site

The inspected site included the following activities:

- R&D associated with missile development;
- Rocket motor testing;
- Production of iron carbonyl;
- Production of propellants; and
- Storage of explosives, propellants, and munitions.

Redstone Arsenal has approximately 25,000 employees. This multifaceted arsenal was completely operational. Both the iron carbonyl and propellent production areas were in operation.

B. DETAILED APPROACH

1. The inspected mandate

The challenge inspection was based on the simulated mandate by the Technical Secretariat to investigate charges made by a State Party under Article IX of the proposed CW Convention that CW were being or had been produced at this site after January 1946. Also the mandate was based on the informal understanding between a control group and Redstone Arsenal officials on the extent of the inspection and how the arsenal officials would "play" the role of the challenged Party.

2. Inspection planning

The control team divided the entire challenge inspection process into discrete essential elements starting from the point of entry and tracing all activities of the inspection. They proposed testing each one of the elements either in table-top (simulated exercises) or as full-up activities at the site. Using this approach allowed the testing of some elements which had not been exercised in prior US trial inspections and also allowed for simulating some expensive previously exercised activities. This resulted in an economical, non-duplicative and coherent NTI.

The elements of the exercise and their disposition are as follows:

- Arrival activity - table-top;

- Notification and response - table-top;
- Perimeter negotiation - table-top and full-up;
- Intraterritorial Transportation/Lodging requirement - table top;
- Design of inspection team/inspection plan - full-up;
- Perimeter control - table-top;
- Broader access negotiations - full-up;
- Denial of access - full-up
- Protection of security/proprietary information - full-up;
- Deployment of technology/equipment - table-top;
- Inspection of selected buildings, bunkers, and warehouse - full-up; and
- Use of foreign languages - omitted.

3. Composition of the inspection team

The inspection team was composed of:

- team leader;
- deputy team leader;
- two chemical engineers knowledgeable in the production of Schedule 1 chemicals;
- two chemists knowledgeable in sampling and analysis;
- two engineers familiar with CW munitions and storage;
- one detection specialist knowledgeable in the operation of the variety of air monitoring equipment brought to the site; and
- one physical protection/safety specialist.

The team was complemented by three US government employees playing the role of the host State representatives and escorts. These people, working with the Redstone facility officials constituted the home team.

There were two other US government employees who played the role of the challenging State observers. In addition, there were four controllers who managed the inspection, maintained the scenario and recorded the activities of the exercise.

4. Inspection equipment

No equipment (unless noted) was actually brought to the site; however the inspectors did select the following equipment for simulated table-top use:

A mobile laboratory that included a power generator, lab hood, refrigerators, a portable PC and printer, and a secure cellular phone with verbal and data transmission capability.

A global positioning sensor (GPS), to assist in finding site locations and to determine the position of all sampling points (brought to site).

Sample equipment such as bottles and jars, scoops, tongs, filter paper, pumps with absorbent tubes, seals, packaging materials, etc.

Detection and monitoring equipment as follows:

- Chemical Agent Monitor (CAM);
- Portable gas chromatograph/mass spectrometer (GC/MS);
- M256 Chemical Agent Detector Kit;
- M272 Chemical Agent Water Testing Kit;
- Industrial hygiene air sampling tubes (Draeger tubes);
- Self-contained breathing apparatus (brought to site); and
- Stethoscope (brought to site).

5. Activities prior to the arrival of the inspection team on-site

General planning for the challenge inspection was developed by a control team based on the Addendum to Appendix I, CD/1033. The controller group made several trips to the site and an understanding was negotiated with Redstone on the facility official's role during the challenge inspection. There was no interface between the control group and the inspection team to provide the inspection team with information.

The inspection team was notified several weeks in advance of the name and location of the site to be inspected. At that time, the concept for exercising the essential elements by table-top or full-up was explained. The members of the team started to simulate assembly of the inspection equipment and supplies needed. The team was given a general plan for challenge inspection together with process information and indicators on the facilities and equipment for the production of chemical weapons. Details on the site and the specific challenge were not discussed.

One week prior to the inspection, the team was given the scenario of the challenge and some background information about the site which was obtained from the open literature. The team reviewed the literature, overhead photos of the site, and site maps. This procedure of limiting access to site data was adopted to add realism to the inspection. The team members were intended to be specialists on inspections, but with little knowledge of the actual site to be inspected. The overhead photos were commercially available and were obtained from the US Geological Survey. The team members were assigned to groups by the team leader when he previewed his plan for conducting the challenge inspection.

6. Advanced preparations on-site

Redstone Arsenal, in anticipation of a challenge inspection, had been working on a plan to address any challenge. The general plan called for using the negotiating time at the requested perimeter to fully understand the nature of the compliance concern, to explore what the inspectors wanted to inspect and how they wanted to conduct the inspection, and to develop alternate methods for the inspectors to consider. The plan would allow full access to former CW facilities, consistent with safety, but they would deny access to all sensitive sites. They would negotiate access to other areas of the site and develop alternate means to address concerns where access was denied.

For the table-top exercises, Redstone Arsenal officials were prepared to facsimile sections of maps to the point of entry for negotiations. Redstone personnel prepared a storage bunker for the exercise with prepositioned inert munitions for use during the challenge inspection. They also had an area designated to which the munitions could be removed and inspected.

7. Duration of inspection

The table-top exercises lasted six (6) hours at the point of entry. The inspection lasted two and one-half (2 1/2) days (9 hours/day) at Redstone Arsenal.

8. Measures to protect national security information

Confidentiality was a primary concern in planning and executing the NTI. The Arsenal security officials were concerned about loss of non-CW related sensitive information. Prior to the inspection, they notified the many tenants at Redstone Arsenal of the inspection and instructed them to be concerned about release of confidential business information and security information. The inspection team had a right to know only about unclassified activities relevant to the declared CW compliance concern. Access to any sensitive areas would have to be justified and negotiated. The only requirement for the host State was to demonstrate that process equipment to produce chemical weapons was not present and CW munitions were not being stored. Before entry was to be allowed in sensitive areas, shrouding was to take place to prevent divulging non-CW information (this was simulated).

9. Arrival activities (simulated)

At the point of entry (POE) Dulles International AP, Washington, D.C., the participants presented themselves and were introduced to the host State national authority (home team). The inspection team presented for inspection all of the equipment that they intended to carry with them to the inspection site. The home team, with support from the US On-Site Inspection Agency (OSIA), simulated going through the equipment for conformity with the inspection protocol of the CWC. Any nonconforming or rejected equipment was impounded at the POE until the team returned from the inspection to leave the country. The accepted equipment and supplies were assessed by the home team to ascertain their transportability in vehicles and/or aircraft. The home team was then responsible for moving the equipment and the inspection team to Redstone Arsenal.

10. Opening conference

Upon completion of the equipment inspection, the opening conference was conducted. The inspection team leader indicated that the purpose of the visit was to conduct a challenge inspection at Redstone Arsenal. The basis for the challenge was presented. The inspection team and home team leaders began the inspection by negotiating a provisional perimeter. The inspection team produced their maps and photos as a basis for requesting the perimeter as close as possible to the old plant areas (plan area #1, plant area #2 and the Redstone Ordnance Plant) and the Gulf CW Depot. The home team indicated they would only accept the current public boundaries of the Arsenal as a provisional perimeter. However, they were willing to continue the negotiations at the site. The home team did not offer any other maps or information at the POE.

The second opening conference took place at Redstone Arsenal. The inspection team and the home team (which now included the State national authority, escorts and facility officials) were introduced. The inspection team leader presented the purpose of the visit and the basis for the challenge inspection. The home team indicated there was no validity to the challenge and they would make every effort to allow access to facilities for verification. The facility officials made an initial presentation covering history of the Arsenal and a safety briefing. Following the presentation, negotiations were conducted to secure the site and renegotiate the provisional perimeter.

11. Securing the site (simulated)

Negotiations were conducted to establish how the site would be secured. This included securing the gates, perimeter control and control of all traffic. It has agreed that when any vehicle of five (5) ton capacity or larger was to leave the Arsenal, the inspection team would be notified so that the vehicle could be inspected. The inspection team would also have a two man roving patrol to randomly check gates, fences and vehicles to ensure no prohibited materials were being moved off or about the Arsenal during the inspection. This roving patrol would also be monitoring buildings and storage areas where seals would be placed on facilities to be subsequently inspected or sampled. The roving patrol would be accompanied by a facility official and home team escort.

12. Plant orientation tour

At the second opening conference negotiations, the home team agreed to provide a bus tour of the Arsenal. The negotiated tour route was based on driving in or around the old plant areas and through the old Gulf CW Storage Deport. During the tour the inspection team noted the building numbers of suspect buildings and facilities which could have capability for CW activities. These indicators included storage tanks, stacks, special security fences, environmental controls, unloading ramps or buildings sufficiently large to house chemical plants. This orientation tour was the basis for conducting further negotiations for access within the site. The inspection team decided to forgo sampling at the provisional perimeter because the home team indicated they would allow limited sampling within the final perimeter and at the exterior of suspect facilities.

13. Inspection of plant areas

After the tour, the inspection team met to finalize and prioritize the areas to which access was desired. The inspection team then met with the home team to complete negotiations to access the facilities of concern. Access to the majority of

these facilities was allowed. However, some buildings required obtaining keys and escorts from tenant organizations. Some areas necessitated shrouding classified items or activities. Both of these were time consuming tasks.

The inspection team was divided into two groups and, accompanied by escorts, inspected the inside of buildings where access was permitted. Samples were not actually taken, but it was during this period when sampling would normally have been accomplished at the facilities of concern. At several sensitive buildings, access was denied. As an alternative, access was limited to one or two inspectors and they were only permitted to look within the building from the doorway. This would allow them to see that CW production equipment was not present or CW was not being stored and precluded the necessity of closer inspection of sensitive areas.

Two chemical plant areas were identified, the iron carbonyl and propellant facilities. Access was permitted to the iron carbonyl facility. Access was not permitted to the propellant plant since it was in operation. An inspection in this facility would have required a shut down, for safety reasons. During a real inspection, access to the facility would have been allowed, according to the home team, to alleviate the challenge concerns.

The storage areas were inspected separately and are addressed below.

14. Inspection of storage areas

Redstone Arsenal has more than 400 storage bunkers or warehouses which were of concern to the inspection team. The recommended sampling strategy to find chemical munitions stored among conventional munitions or other material was to conduct completely random sampling. It gave every munition stored at the site an equal chance of being included in the sample of rounds to be selected and tested. For the inspection the assumption was made that the inspection team was looking for a militarily significant quantity of 100 tons of chemical agents equivalent to 25,000 chemical artillery rounds. The calculations resulted in the necessity to sample 80 of the bunkers to have a 90 percent probability of finding at least one chemical round. This was based on the assumption that 2000 munitions could be stored in each bunker. To gather data on the sampling procedures, it was decided to seal and subsequently sample only 20 bunkers/warehouses.

After the sample of eighty storage bunkers was randomly selected, 20 bunkers were picked in areas in which Redstone officials would allow access. Each bunker was visited and secured with tamper-resistant seals. The following day the

bunkers were again visited to remove the sample munition. The specific munition to be sampled within the bunker was selected using a randomly generated three dimensional coordinate. A round was removed from only one bunker (which had been prearranged). Some munitions for study had been placed at the hypothetical sampling point. These munitions were removed and taken to a work area for testing.

At the work area, the simple approach taken was to determine if the munition contained a liquid. Using a stethoscope and rocking the munition, the inspector would be able to hear the gentle lapping motion or sound of liquid. The criteria, which will be discussed further, were that liquid indicated the presence of a chemical agent and no sloshing indicated a non-CW munition.

15. Inspection of drawings, operating procedures and records

The only drawings which were provided were of the NASA Marshall Space Flight Center buildings. Many of these buildings were part of the Huntsville Arsenal production area, constructed in 1943. However, they had all been converted to warehouse and office facilities or labs. None contained any process equipment for production of chemicals. Once it was established that production equipment was not present, no further requests were made for drawings or operating procedures.

The only areas which contained chemical process equipment were the iron carbonyl and propellant plants which would be inspected and therefore drawings were not required.

16. Sampling

No samples were actually taken during this inspection. However, a sampling plan was prepared on the basis of the general inspection plan.

a. Outer perimeter (provisional)

No samples would have been taken at the provisional perimeter of the Arsenal because it was miles away from the areas of concern and the facility officials offered access within the perimeter.

b. Inner perimeter (final)

Environmental sampling would have been used to aid in determining if suspected production facilities, identified during the tour, were still or recently producing CW. A variety of samples would have been taken (i.e., soil, vegetation, air, water). The location of such samples would have been as close to

the suspected facility as possible. Real time ambient air samples would have been taken there as well. The weakness in this approach was that CW was produced there 44 years ago and residual contamination was still present throughout this site. At least 17 contaminated sites had been identified in recent years.

17. Analysis of samples

An extensive array of analytical equipment was selected primarily to do analyses on-site. This capability could enhance a challenge inspection by identifying and resolving anomalies during the inspection. It would also preclude the loss of proprietary or national security information when removing samples from the sites. The concern is that the samples could be subjected to extensive exploitation.

18. Closing conference

The closing conference was conducted by the inspection team leader and the host State representative assisted by the facility officials. The team leader reviewed the three days' activities, stating that the inspection team was given adequate opportunity to satisfy the concerns about Redstone Arsenal's alleged CW production with the exception of prohibited access to the interior of two buildings. The facility officials said that access could only have been allowed after extensive shrouding, which the time and manpower available for this inspection would not permit. Environmental sampling around these facilities may have provided some evidence of internal activities, and access inside the building for a quick look could have alleviated the concern if no CW process equipment were present. The team leader stated that the allegation could not be totally absolved because it would be possible for these buildings to house a good portion of the militarily significant quantity of CW munitions (25,000 rounds).

19. Anomalies, disputes and complications

No anomalies were intentionally introduced. Access to some facilities was denied the inspection team. Extensive shrouding may have allowed access in one area. In another area, access was denied the inspection team for this exercise, but would have been allowed if it were a real challenge inspection. (For safety reasons, the operation would have had to be suspended or access delayed until the operation was completed. Neither was considered.)

20. Impact of the inspection on facility operations

This inspection had no impact on Redstone Arsenal operations. As indicated above, a real challenge inspection

could have had some impact. About 1100 hours ($22,000) of effort were expended by Redstone Arsenal in meetings and preparation with the control group, participation in the trial inspection, and monitoring and escorting.

C. RESULTS/DISCUSSION

1. Inspection planning

This trial inspection successfully utilized a combination of full-up and table-top (simulated) exercises to investigate important elements of a challenge inspection. The arrival activities which were table-top used much of the OSIA's experience and facilities. The OSIA's POE experience was directly translatable under the CW regime. Arrival issues were addressed by a USG contractor and OSIA personnel with all necessary facilities in place at the POE at Dulles Airport. Inspection teams could have been met at the terminal, screened and processed at the existing OSIA center and housed at an adjacent motel with OSIA escorts. There was a general agreement that, due to the cost and fragility of the equipment which would be used under a CW regime, it was not a good idea to allow the permanent storage of Technical Secretariat equipment at the POE.

The OSIA Operations Center, with its communication links and around-the-clock manning, was an adequate prototype for US requirement in a CW regime.

In planning perimeter negotiations at the POE, the need for a site representative would be valuable if any access within the site fencing or public boundary needed to be negotiated. The site representative would have required a minimum of 8 hours to reach the POE (Washington, DC) to support the activities with scheduled airline availability being the major constraint. The alternate is to negotiate these details in the vicinity of the facility.

The inspection team had acquired four photographic plates of commercially available overhead photography of Redstone Arsenal. The plates were 3' X 3' color photos of 1:15400 scale. From examination of these photos, the team selected a requested perimeter for the team leader to negotiate. After 1 1/2 hours of negotiating, the home team declared that the provisional perimeter would be the Arsenal outer fence line. The inspection team leader indicated that this was inadequate to resolve compliance concerns at the site, particularly noting that environmental samples at this perimeter were not likely to be of any benefit given the distance from the areas of concern and the previous production of CW.

It became evident that good quality site maps were critical to defining the perimeter and developing a managed

access plan. Criteria need to be developed and included in the CWC for provision of detail maps, and for negotiations of perimeters and managed access.

2. Challenge inspection approach

The approach taken in this trial inspection was to negotiate the provisional perimeter at the POE and to negotiate further access once the inspection team reached the site. Upon arrival at the site, the immediate objective was to negotiate a tour to identify facilities and the basis for negotiating a final perimeter for sampling and further access. The route of the bus tour of the site was selected by the inspection team to pass around or through the old CW production plant areas and the Gulf CW Storage Depot area. The inspection team was then in position to finalize the inspection plan, identify the buildings and bunkers where entry was desired and samples were to be taken. If access to a facility was denied, further negotiations of alternative means were undertaken to satisfy the concern. This could include sampling around the facility or possibly negotiating the entry of one member of the inspection team to look inside the building from the door. It would be readily apparent from the doorway whether the facility could be a chemical plant or storage area for CW. Another approach was for the home team to shroud any sensitive equipment, displays or information and then allow some limited access to the inspection team. This led to an inspection plan which addressed the concerns of the challenge, minimized intrusiveness and protected the proprietary or national security concerns of the home State.

3. Production equipment inspection

Using the CW indicators identified above, buildings were selected for inspection. Only two areas were found to contain chemical process equipment. One was used for manufacture of iron carbonyl and the other for rocket propellant. The iron carbonyl facility was inspected and no CW production capability was observed. Access to the propellant area was denied because of safety and cost (shutdown would have been required). However, the inspection team was assured that access would have been permitted in a real challenge inspection.

All the old production areas were entered and inspected. Four buildings were challenged as having some of the characteristics of a possible chemical plant; i.e., high bay, exterior tankage, taller than normal stacks, etc. One of these buildings was also enclosed in a separate security area. However, after receiving access it was easily determined that one of them was the power generating station and the rest were facilities involved in the testing of various rocket motor components.

Access to only two buildings (enclosed with concertina wire fencing) was denied with no reservations. Denial was based on a need to protect national security information. The inspection team was allowed to walk around he facilities and sampling would have been permitted. The buildings did not appear to be production facilities but could have been used to store CW. This was noted by the inspection team. In subsequent discussions, the home team pointed out that inspection after extensive shrouding may have been possible. However, the shrouding would have taken several days which may have been prohibitive for a challenge inspection.

4. Storage facility inspection

As indicated previously 80 storage buildings were selected for inspection. There were various reasons expressed by the home team why access to some could not be permitted which are listed as follows:

- there were explosives present (in the building or in the area);
- there were other hazardous materials present (residual chemical or environmental);
- there was a possible radiation hazard;
- they would have to shroud sensitive items present; and
- they would have to shroud proprietary information.

The inspection team must be prepared to deal with each of these situations which are legitimate excuses and take extra time. Shrouding is an uncontrollable parameter and alternatives must be offered to avoid excessive delays in the inspection. If there is a possibility of chemical or environmental hazards, the inspectors will require protective clothing which will have to be brought along or provided by the host State. Inspectors may prefer to bring their own protective outfits, but it may require local support (e.g., compressed air). It is apparent that gaining access to the storage areas will be tedious and time consuming.

Once access has been obtained, using the statistical sampling plan, sample munitions will be identified, marked and removed from the storage area to a work area. This is necessary because there is no in-place methodology for assessing whether a munition is CW. This is another labor intensive operation. If the munition selected is part of a unit or pallet of six or eight other munitions, the pallet must be disassembled to remove the

selected sample. In performing these operations at Redstone Arsenal, it took about one hour to don protective clothing (brought by the inspection team), enter the selected bunker, go to the randomly selected coordinates to identify the randomly selected munition, tag the munition and remove the munition to the work area. Obtaining the 80 sample munitions would have taken over three days, working 24 hours per day.

It was noted during the inspection that the bunkers were approximately 10 percent filled. Thus, the initial estimate for the number of munitions within the stockpile was excessive. A munition stockpile of 90 percent less size would only require eight munitions to be sampled. In a real situation, after obtaining the corrected size of the stockpile, the eight munitions to be sampled would be randomly selected from the 80 munitions previously tagged.

5. Munition inspection

If a munition is of concern or suspected of being a chemical round, it has been presumed that the host State must prove that the munition is not chemical. This could be done by many destructive methods (i.e., cutting, drilling, firing, exploding). All are hazardous, polluting and destructive procedures. At present, the stethoscope method was used to detect a sloshing liquid when the munition is rocked. This was only marginally satisfactory, as some of the chemical agents may be solids or viscous liquids or below the melting point. In addition, if the contents of the munition are proven to be a liquid, it still may not be CW (e.g., white phosphorus, an incendiary).

No chemical munitions were found during this exercise. Overall, the approach of randomly selecting munitions and bunkers seemed to work reasonably well. The question of how to assess the selected munition is open. The need for an in-place nondestructive test method is the predominant knowledge gap requirement. Also, the inspectors must be able to inspect munitions and determine whether they are CW or not without exposing sensitive weapons technology. However, even with such a method or device, the ultimate responsibility to demonstrate that a suspect round is not CW resides with the inspected party.

6. Records audit

The facility officials were questioned on whether records existed on the disposition of the old production equipment. They indicated that such records would be difficult to find. They referenced some of the publications which show that operations were stopped at the end of World War II. Equipment was decontaminated and disposed of. Much of the equipment was buried in what are identified today as contaminated

areas. Demilitarization and disposal of CW munitions and equipment was completed in 1955.

7. Sampling and detection

No samples were taken and no detection equipment was brought to Redstone Arsenal for this inspection. Sampling at the arsenal boundary would have had little relevance because it would be miles from the operating areas. Also this arsenal was the site of CW operations in World War II and still has 17 identified contaminated areas. It is believed that sampling would only have been effective at the exterior of several facilities where access was denied. The presence of chemical agent residues or hydrolysis products could have been the basis for an allegation concerning the facility. It would place the burden on the host State to provide further information or limited access to avoid an ambiguity.

8. Securing the site

A site the size (50 square miles) of Redstone Arsenal is extremely difficult to totally secure. Several public highways run through the installation and there are thousands of buildings and hundreds of storage bunkers of concern. Negotiations were conducted to seal some gates (simulated) and allow a roving patrol to monitor the main gates and storage areas. This would preclude the movement of a significant quantity of munitions. The facility officials also agreed to notify the inspection team when any vehicle of five ton capacity or larger was to leave the arsenal. This would provide the team with the opportunity to inspect the contents. However, it was apparent that an inspection team of ten was inadequate to inspect and control a site of this size.

9. The inspection team

The exercise demonstrated the need for experienced multidisciplinary inspection teams. There was a need for chemical processing, analytical chemistry, munitions design and storage, chemical detection and statistical analysis experience. There was the need for enough "depth" on the team to provide for dividing into subteams to cover such a large, diverse site. The team had to be knowledgeable in individual protection and safety around chemical agents, explosives and a variety of munitions. It would have required a team of at least 15 people and 7 days of inspection to adequately inspect a site of this size and complexity. (This estimate does not include interpreters if necessary.) Most of the inspection time was required for the storage area.

10. The challenging State observers

The challenging State observers duties were to observe that the inspection team inspected the areas of concern as defined in the challenge and that the mandate of the Technical Secretariat was executed. As part of this exercise, the observers were also requested to determine how much non-CW information they could gather. Their report indicated extra information was volunteered, some locations were visited longer than necessary and more shrouding could have been used.

11. Confidentiality

As indicated above, national security and proprietary information is vulnerable and must be protected in a challenge inspection. From the host State point of view, confidentiality must be the paramount consideration. However, the concerns of the allegations must be addressed. The host State representatives, the facility officials and the escorts must be aware at all times that loss of information is possible. They must take appropriate measures to shroud sensitive items or equipment, but they must be prepared to offer alternative methods of inspection to demonstrate compliance.

12. Areas requiring further work

This inspection has continued to make clear the need to conduct additional trial inspections to test each regime and monitoring aspect of the planned convention. Trial inspections at government installations as well as in the chemical industry must be conducted to determine how best to conduct an inspection and how best to protect both national security and proprietary information.

A need exists for the development or identification of sensitive, portable analytical equipment which can be brought with the inspection team and operated on-site during an inspection.

A need exists for the development of nondestructive testing equipment to distinguish between CW munitions and conventional munitions. It would greatly expedite the inspection if the testing could be done without removing the munitions from the bunker.

Statistical sampling plans vary with confidence levels and assumptions about significant quantities. Criteria for both of these items need to be developed and with consideration of time, environmental and regulatory constraints.

While procedures need to be flexible to allow for negotiations and individual site circumstances, provisions for

challenge inspections need to be contained in an inspection protocol to establish basic rights and responsibilities to minimize the amount of negotiation at the beginning of each inspection. For example, responsibilities and obligations of the host State and inspectors with respect to photography, sampling, site maps, access to documents, etc., should be specified. Negotiations at the site would then focus on site specific issues.

A protocol needs to be developed which would resolve ambiguities arising from shrouding. This protocol must clearly allay the concerns of the challenging State while protecting the national security and proprietary concerns of the host State.

D. CONCLUSIONS

With respect to the challenge, no capability to produce CW and no CW munitions were found.

The table-top exercises which were employed for several of the elements of this challenge inspection were completely satisfactory. This method allowed elements which had not been exercised previously to be tested with all of the participants. Much knowledge was gained with little expenditure of funds and no equipment requirements.

Good quality maps for both the inspection team and home team assisted by a facility official are essential to negotiations of a perimeter at the POE of the challenged State. The challenge should describe and specify in a site diagram with geographic coordinates the areas of concern and the site perimeter desired.

Negotiations on access within the perimeter are best conducted after a tour of the site.

Presence or absence of chemical production equipment is the most important aspect of determining the capability to produce Schedule 1 chemicals.

Shrouding equipment and displays is a useful alternative to preclude intrusiveness and satisfy the verification requirements of a challenge inspection. Limited access (within the doorway of a facility) enables the presence or absence of production capabilities to be confirmed in most instances.

Statistical sampling of storage bunkers and munitions appears to be a satisfactory method to identify munitions for inspection. A reliable method of nondestructive testing to determine if the munition is CW or not is urgently needed.

Securing a site the size of Redstone Arsenal by patrolling the perimeter is impractical. Alternatives, including a roving patrol, closing some exits and monitoring the open exits, may be effective in preventing or detecting the moving/shifting of prohibited materials during an inspection.

CONFERENCE ON DISARMAMENT

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REPORT ON THE FOURTH UNITED STATES TRIAL INSPECTION EXERCISE

Introduction

The United States government is continuing development of inspection procedures which will contribute to monitoring and verification measures for a Chemical Weapons Convention (CWC). In February 1989, United States experts conducted a National Trial Inspection (NTI) at the facility operated by Akzo Chemicals Inc., in Gallipolis Ferry, West Virginia. In March 1990, the United States conducted the second NTI at Alcolac Inc., in Baltimore, Maryland. Both of these exercises tested routine inspection procedures. The third NTI was a challenge inspection conducted in September 1990 at Monsanto Agricultural Company's Luling, Louisiana plant. The results of the first United States NTI were reported in CD/822, 22 June 1989. Results on the second NTI exercise were reported in CD/WP/WP.301, 27 June 1990. Results of the third NTI were reported in CD/1100, 14 August 1991.

The purpose of this fourth exercise was to conduct a challenge inspection in a sensitive undeclared government facility which included munition storage bunkers and warehouses. The inspection was conducted on 15-17 January 1991 at Redstone Arsenal, Huntsville, Alabama. It included assessment of production capability, inspection of various storage facilities for possible presence of CW materials, host/observer State simulation, escort simulation and assessment of all essential elements of a challenge inspection. The inspection started at the point of entry and simulated many of these activities by "table-top" exercises. This inspection did not include utilizing detection equipment or taking samples although these elements were considered and accounted for in a simulated manner.

The scenario for the challenge inspection was based on the allegation that Huntsville Arsenal and the Gulf Chemical Warfare Depot, once located at the present site of Redstone Arsenal, although not declared by the United States as CW facilities were, in fact, still engaged in CW production and storage. The Technical Secretariat was requested to confirm that Redstone Arsenal no longer contained a CW production capability and that CW munitions were no longer present or stored at this site. From the point of view of the scenario, the challenge was

particularly worrisome because many of the World War II buildings do still exist although they have been converted to other uses, many of which are sensitive for national security reasons.

Under the challenge inspection protocol of the CWC, the challenged State is obliged to take appropriate steps to demonstrate its compliance with the CWC. The US policy is to fulfill the obligation without compromising national security considerations. In that regard, the approach of the home team was to address all the legitimate compliance concerns but to be tough negotiators in the process and to protect all sensitive sites.

The inspection team plan was to request a perimeter as near to the old production plants and storage areas as possible. Then, using a negotiated managed access, attempt to gain access to the former CW facilities to inspect and take samples if warranted. Recognizing that there were hundreds of storage buildings, a statistical sampling plan was employed to inspect a suitable number of storage areas to determine any relevance to the alleged violation. A tour of the site was also requested to inspect for CW characteristic facilities and subsequent negotiations were conducted to gain access to those facilities which could be used in prohibited CW activities.

A. GENERAL APPROACH

1. Objectives of the NTI

The main objectives of this challenge inspection were as follows:

- To gain experience for developing procedures which would facilitate determination of compliance with the CWC during a challenge inspection (CI).

- To determine if the site had the equipment and capability to produce Schedule 1 chemicals and whether CW weapons were stored there.

- To test our ability to adequately safeguard national security and proprietary information during a CI at a sensitive storage facility.

- To evaluate full-up and table-top exercises when performing the essential elements of a CI (notification, entry, etc.).

- To examine negotiation of a site perimeter and access within the perimeter as a means to alleviate concerns of the challenging State.

- To determine inspection manpower and costs of a CI.

- To determine the capabilities and physical constraints of an inspection team (associated with inspecting a storage site).

- To determine site manpower and training requirements necessary to accommodate a CI at a sensitive site.

2. Provisions in the draft convention under which the NTI took place

The NTI drew on the provisions governing challenge inspections as set forth in the Addendum to Annex 1, Protocol on Inspection Procedures, Part I and Part III contained in CD/1033.

3. Type of on-site inspection

The NTI was based on the challenge inspection of an undeclared facility.

4. Advance Information

In order to utilize the facilities of Redstone Arsenal, a control group formulated an understanding with Redstone on "what to expect" and "how to play" the exercise. Because it was a challenge of an undeclared facility, no facility agreement would be available. The inspection team was provided with advance site specific information, seven (7) days prior to the inspection.

5. Type of facility inspected

Redstone Arsenal is a large (about 32,000 acres) government-owned installation. It is the headquarters of US Army Missile Command (MICOM), the Marshall Space Flight Center, the Ordnance Missile and Munition Center and School, and numerous other tenant organizations. Morton-Thiokol Inc., also performs certain missile work for the Army in government-owned facilities located on the arsenal. In World War II, the installation was the location of Huntsville Arsenal, Redstone Ordnance Plant and the Gulf Chemical Warfare Depot. These three organizations were used for production of chemical agents, manufacture of chemical

ordnance, loading/assembly of ordnance, and storage and shipment of chemical weapons. Such activity ceased at the end of World War II, in 1945.

6. Type of activity at the site

The inspected site included the following activities:

- R&D associated with missile development;
- Rocket motor testing;
- Production of iron carbonyl;
- Production of propellants; and
- Storage of explosives, propellants, and munitions.

Redstone Arsenal has approximately 25,000 employees. This multifaceted arsenal was completely operational. Both the iron carbonyl and propellent production areas were in operation.

B. DETAILED APPROACH

1. The inspected mandate

The challenge inspection was based on the simulated mandate by the Technical Secretariat to investigate charges made by a State Party under Article IX of the proposed CW Convention that CW were being or had been produced at this site after January 1946. Also the mandate was based on the informal understanding between a control group and Redstone Arsenal officials on the extent of the inspection and how the arsenal officials would "play" the role of the challenged Party.

2. Inspection planning

The control team divided the entire challenge inspection process into discrete essential elements starting from the point of entry and tracing all activities of the inspection. They proposed testing each one of the elements either in table-top (simulated exercises) or as full-up activities at the site. Using this approach allowed the testing of some elements which had not been exercised in prior US trial inspections and also allowed for simulating some expensive previously exercised activities. This resulted in an economical, non-duplicative and coherent NTI.

The elements of the exercise and their disposition are as follows:

- Arrival activity - table-top;

- Notification and response - table-top;

- Perimeter negotiation - table-top and full-up;

- Intraterritorial Transportation/Lodging requirement - table top;

- Design of inspection team/inspection plan - full-up;

- Perimeter control - table-top;

- Broader access negotiations - full-up;

- Denial of access - full-up

- Protection of security/proprietary information - full-up;

- Deployment of technology/equipment - table-top;

- Inspection of selected buildings, bunkers, and warehouse - full-up; and

- Use of foreign languages - omitted.

3. Composition of the inspection team

The inspection team was composed of:

- team leader;

- deputy team leader;

- two chemical engineers knowledgeable in the production of Schedule 1 chemicals;

- two chemists knowledgeable in sampling and analysis;

- two engineers familiar with CW munitions and storage;

- one detection specialist knowledgeable in the operation of the variety of air monitoring equipment brought to the site; and

- one physical protection/safety specialist.

The team was complemented by three US government employees playing the role of the host State representatives and escorts. These people, working with the Redstone facility officials constituted the home team.

There were two other US government employees who played the role of the challenging State observers. In addition, there were four controllers who managed the inspection, maintained the scenario and recorded the activities of the exercise.

4. Inspection equipment

No equipment (unless noted) was actually brought to the site; however the inspectors did select the following equipment for simulated table-top use:

A mobile laboratory that included a power generator, lab hood, refrigerators, a portable PC and printer, and a secure cellular phone with verbal and data transmission capability.

A global positioning sensor (GPS), to assist in finding site locations and to determine the position of all sampling points (brought to site).

Sample equipment such as bottles and jars, scoops, tongs, filter paper, pumps with absorbent tubes, seals, packaging materials, etc.

Detection and monitoring equipment as follows:

- Chemical Agent Monitor (CAM);
- Portable gas chromatograph/mass spectrometer (GC/MS);
- M256 Chemical Agent Det :tor Kit;
- M272 Chemical Agent Water Testing Kit;
- Industrial hygiene air sampling tubes (Draeger tubes);
- Self-contained breathing apparatus (brought to site); and
- Stethoscope (brought to site).

5. Activities prior to the arrival of the inspection team on-site

General planning for the challenge inspection was developed by a control team based on the Addendum to Appendix I, CD/1033. The controller group made several trips to the site and an understanding was negotiated with Redstone on the facility official's role during the challenge inspection. There was no interface between the control group and the inspection team to provide the inspection team with information.

The inspection team was notified several weeks in advance of the name and location of the site to be inspected. At that time, the concept for exercising the essential elements by table-top or full-up was explained. The members of the team started to simulate assembly of the inspection equipment and supplies needed. The team was given a general plan for challenge inspection together with process information and indicators on the facilities and equipment for the production of chemical weapons. Details on the site and the specific challenge were not discussed.

One week prior to the inspection, the team was given the scenario of the challenge and some background information about the site which was obtained from the open literature. The team reviewed the literature, overhead photos of the site, and site maps. This procedure of limiting access to site data was adopted to add realism to the inspection. The team members were intended to be specialists on inspections, but with little knowledge of the actual site to be inspected. The overhead photos were commercially available and were obtained from the US Geological Survey. The team members were assigned to groups by the team leader when he previewed his plan for conducting the challenge inspection.

6. Advanced preparations on-site

Redstone Arsenal, in anticipation of a challenge inspection, had been working on a plan to address any challenge. The general plan called for using the negotiating time at the requested perimeter to fully understand the nature of the compliance concern, to explore what the inspectors wanted to inspect and how they wanted to conduct the inspection, and to develop alternate methods for the inspectors to consider. The plan would allow full access to former CW facilities, consistent with safety, but they would deny access to all sensitive sites. They would negotiate access to other areas of the site and develop alternate means to address concerns where access was denied.

For the table-top exercises, Redstone Arsenal officials were prepared to facsimile sections of maps to the point of entry for negotiations. Redstone personnel prepared a storage bunker for the exercise with prepositioned inert munitions for use during the challenge inspection. They also had an area designated to which the munitions could be removed and inspected.

7. Duration of inspection

The table-top exercises lasted six (6) hours at the point of entry. The inspection lasted two and one-half (2 1/2) days (9 hours/day) at Redstone Arsenal.

8. Measures to protect national security information

Confidentiality was a primary concern in planning and executing the NTI. The Arsenal security officials were concerned about loss of non-CW related sensitive information. Prior to the inspection, they notified the many tenants at Redstone Arsenal of the inspection and instructed them to be concerned about release of confidential business information and security information. The inspection team had a right to know only about unclassified activities relevant to the declared CW compliance concern. Access to any sensitive areas would have to be justified and negotiated. The only requirement for the host State was to demonstrate that process equipment to produce chemical weapons was not present and CW munitions were not being stored. Before entry was to be allowed in sensitive areas, shrouding was to take place to prevent divulging non-CW information (this was simulated).

9. Arrival activities (simulated)

At the point of entry (POE) Dulles International AP, Washington, D.C., the participants presented themselves and were introduced to the host State national authority (home team). The inspection team presented for inspection all of the equipment that they intended to carry with them to the inspection site. The home team, with support from the US On-Site Inspection Agency (OSIA), simulated going through the equipment for conformity with the inspection protocol of the CWC. Any nonconforming or rejected equipment was impounded at the POE until the team returned from the inspection to leave the country. The accepted equipment and supplies were assessed by the home team to ascertain their transportability in vehicles and/or aircraft. The home team was then responsible for moving the equipment and the inspection team to Redstone Arsenal.

10. Opening conference

Upon completion of the equipment inspection, the opening conference was conducted. The inspection team leader indicated that the purpose of the visit was to conduct a challenge inspection at Redstone Arsenal. The basis for the challenge was presented. The inspection team and home team leaders began the inspection by negotiating a provisional perimeter. The inspection team produced their maps and photos as a basis for requesting the perimeter as close as possible to the old plant areas (plan area #1, plant area #2 and the Redstone Ordnance Plant) and the Gulf CW Depot. The home team indicated they would only accept the current public boundaries of the Arsenal as a provisional perimeter. However, they were willing to continue the negotiations at the site. The home team did not offer any other maps or information at the POE.

The second opening conference took place at Redstone Arsenal. The inspection team and the home team (which now included the State national authority, escorts and facility officials) were introduced. The inspection team leader presented the purpose of the visit and the basis for the challenge inspection. The home team indicated there was no validity to the challenge and they would make every effort to allow access to facilities for verification. The facility officials made an initial presentation covering history of the Arsenal and a safety briefing. Following the presentation, negotiations were conducted to secure the site and renegotiate the provisional perimeter.

11. Securing the site (simulated)

Negotiations were conducted to establish how the site would be secured. This included securing the gates, perimeter control and control of all traffic. It has agreed that when any vehicle of five (5) ton capacity or larger was to leave the Arsenal, the inspection team would be notified so that the vehicle could be inspected. The inspection team would also have a two man roving patrol to randomly check gates, fences and vehicles to ensure no prohibited materials were being moved off or about the Arsenal during the inspection. This roving patrol would also be monitoring buildings and storage areas where seals would be placed on facilities to be subsequently inspected or sampled. The roving patrol would be accompanied by a facility official and home team escort.

12. Plant orientation tour

At the second opening conference negotiations, the home team agreed to provide a bus tour of the Arsenal. The negotiated tour route was based on driving in or around the old plant areas and through the old Gulf CW Storage Deport. During the tour the inspection team noted the building numbers of suspect buildings and facilities which could have capability for CW activities. These indicators included storage tanks, stacks, special security fences, environmental controls, unloading ramps or buildings sufficiently large to house chemical plants. This orientation tour was the basis for conducting further negotiations for access within the site. The inspection team decided to forgo sampling at the provisional perimeter because the home team indicated they would allow limited sampling within the final perimeter and at the exterior of suspect facilities.

13. Inspection of plant areas

After the tour, the inspection team met to finalize and prioritize the areas to which access was desired. The inspection team then met with the home team to complete negotiations to access the facilities of concern. Access to the majority of

these facilities was allowed. However, some buildings required obtaining keys and escorts from tenant organizations. Some areas necessitated shrouding classified items or activities. Both of these were time consuming tasks.

The inspection team was divided into two groups and, accompanied by escorts, inspected the inside of buildings where access was permitted. Samples were not actually taken, but it was during this period when sampling would normally have been accomplished at the facilities of concern. At several sensitive buildings, access was denied. As an alternative, access was limited to one or two inspectors and they were only permitted to look within the building from the doorway. This would allow them to see that CW production equipment was not present or CW was not being stored and precluded the necessity of closer inspection of sensitive areas.

Two chemical plant areas were identified, the iron carbonyl and propellant facilities. Access was permitted to the iron carbonyl facility. Access was not permitted to the propellant plant since it was in operation. An inspection in this facility would have required a shut down, for safety reasons. During a real inspection, access to the facility would have been allowed, according to the home team, to alleviate the challenge concerns.

The storage areas were inspected separately and are addressed below.

14. Inspection of storage areas

Redstone Arsenal has more than 400 storage bunkers or warehouses which were of concern to the inspection team. The recommended sampling strategy to find chemical munitions stored among conventional munitions or other material was to conduct completely random sampling. It gave every munition stored at the site an equal chance of being included in the sample of rounds to be selected and tested. For the inspection the assumption was made that the inspection team was looking for a militarily significant quantity of 100 tons of chemical agents equivalent to 25,000 chemical artillery rounds. The calculations resulted in the necessity to sample 80 of the bunkers to have a 90 percent probability of finding at least one chemical round. This was based on the assumption that 2000 munitions could be stored in each bunker. To gather data on the sampling procedures, it was decided to seal and subsequently sample only 20 bunkers/warehouses.

After the sample of eighty storage bunkers was randomly selected, 20 bunkers were picked in areas in which Redstone officials would allow access. Each bunker was visited and secured with tamper-resistant seals. The following day the

bunkers were again visited to remove the sample munition. The specific munition to be sampled within the bunker was selected using a randomly generated three dimensional coordinate. A round was removed from only one bunker (which had been prearranged). Some munitions for study had been placed at the hypothetical sampling point. These munitions were removed and taken to a work area for testing.

At the work area, the simple approach taken was to determine if the munition contained a liquid. Using a stethoscope and rocking the munition, the inspector would be able to hear the gentle lapping motion or sound of liquid. The criteria, which will be discussed further, were that liquid indicated the presence of a chemical agent and no sloshing indicated a non-CW munition.

15. Inspection of drawings, operating procedures and records

The only drawings which were provided were of the NASA Marshall Space Flight Center buildings. Many of these buildings were part of the Huntsville Arsenal production area, constructed in 1943. However, they had all been converted to warehouse and office facilities or labs. None contained any process equipment for production of chemicals. Once it was established that production equipment was not present, no further requests were made for drawings or operating procedures.

The only areas which contained chemical process equipment were the iron carbonyl and propellant plants which would be inspected and therefore drawings were not required.

16. Sampling

No samples were actually taken during this inspection. However, a sampling plan was prepared on the basis of the general inspection plan.

a. Outer perimeter (provisional)

No samples would have been taken at the provisional perimeter of the Arsenal because it was miles away from the areas of concern and the facility officials offered access within the perimeter.

b. Inner perimeter (final)

Environmental sampling would have been used to aid in determining if suspected production facilities, identified during the tour, were still or recently producing CW. A variety of samples would have been taken (i.e., soil, vegetation, air, water). The location of such samples would have been as close to

the suspected facility as possible. Real time ambient air samples would have been taken there as well. The weakness in this approach was that CW was produced there 44 years ago and residual contamination was still present throughout this site. At least 17 contaminated sites had been identified in recent years.

17. Analysis of samples

An extensive array of analytical equipment was selected primarily to do analyses on-site. This capability could enhance a challenge inspection by identifying and resolving anomalies during the inspection. It would also preclude the loss of proprietary or national security information when removing samples from the sites. The concern is that the samples could be subjected to extensive exploitation.

18. Closing conference

The closing conference was conducted by the inspection team leader and the host State representative assisted by the facility officials. The team leader reviewed the three days' activities, stating that the inspection team was given adequate opportunity to satisfy the concerns about Redstone Arsenal's alleged CW production with the exception of prohibited access to the interior of two buildings. The facility officials said that access could only have been allowed after extensive shrouding, which the time and manpower available for this inspection would not permit. Environmental sampling around these facilities may have provided some evidence of internal activities, and access inside the building for a quick look could have alleviated the concern if no CW process equipment were present. The team leader stated that the allegation could not be totally absolved because it would be possible for these buildings to house a good portion of the militarily significant quantity of CW munitions (25,000 rounds).

19. Anomalies, disputes and complications

No anomalies were intentionally introduced. Access to some facilities was denied the inspection team. Extensive shrouding may have allowed access in one area. In another area, access was denied the inspection team for this exercise, but would have been allowed if it were a real challenge inspection. (For safety reasons, the operation would have had to be suspended or access delayed until the operation was completed. Neither was considered.)

20. Impact of the inspection on facility operations

This inspection had no impact on Redstone Arsenal operations. As indicated above, a real challenge inspection

could have had some impact. About 1100 hours ($22,000) of effort were expended by Redstone Arsenal in meetings and preparation with the control group, participation in the trial inspection, and monitoring and escorting.

C. RESULTS/DISCUSSION

1. Inspection planning

This trial inspection successfully utilized a combination of full-up and table-top (simulated) exercises to investigate important elements of a challenge inspection. The arrival activities which were table-top used much of the OSIA's experience and facilities. The OSIA's POE experience was directly translatable under the CW regime. Arrival issues were addressed by a USG contractor and OSIA personnel with all necessary facilities in place at the POE at Dulles Airport. Inspection teams could have been met at the terminal, screened and processed at the existing OSIA center and housed at an adjacent motel with OSIA escorts. There was a general agreement that, due to the cost and fragility of the equipment which would be used under a CW regime, it was not a good idea to allow the permanent storage of Technical Secretariat equipment at the POE.

The OSIA Operations Center, with its communication links and around-the-clock manning, was an adequate prototype for US requirement in a CW regime.

In planning perimeter negotiations at the POE, the need for a site representative would be valuable if any access within the site fencing or public boundary needed to be negotiated. The site representative would have required a minimum of 8 hours to reach the POE (Washington, DC) to support the activities with scheduled airline availability being the major constraint. The alternate is to negotiate these details in the vicinity of the facility.

The inspection team had acquired four photographic plates of commercially available overhead photography of Redstone Arsenal. The plates were 3' X 3' color photos of 1:15400 scale. From examination of these photos, the team selected a requested perimeter for the team leader to negotiate. After 1 1/2 hours of negotiating, the home team declared that the provisional perimeter would be the Arsenal outer fence line. The inspection team leader indicated that this was inadequate to resolve compliance concerns at the site, particularly noting that environmental samples at this perimeter were not likely to be of any benefit given the distance from the areas of concern and the previous production of CW.

It became evident that good quality site maps were critical to defining the perimeter and developing a managed

access plan. Criteria need to be developed and included in the CWC for provision of detail maps, and for negotiations of perimeters and managed access.

2. Challenge inspection approach

The approach taken in this trial inspection was to negotiate the provisional perimeter at the POE and to negotiate further access once the inspection team reached the site. Upon arrival at the site, the immediate objective was to negotiate a tour to identify facilities and the basis for negotiating a final perimeter for sampling and further access. The route of the bus tour of the site was selected by the inspection team to pass around or through the old CW production plant areas and the Gulf CW Storage Depot area. The inspection team was then in position to finalize the inspection plan, identify the buildings and bunkers where entry was desired and samples were to be taken. If access to a facility was denied, further negotiations of alternative means were undertaken to satisfy the concern. This could include sampling around the facility or possibly negotiating the entry of one member of the inspection team to look inside the building from the door. It would be readily apparent from the doorway whether the facility could be a chemical plant or storage area for CW. Another approach was for the home team to shroud any sensitive equipment, displays or information and then allow some limited access to the inspection team. This led to an inspection plan which addressed the concerns of the challenge, minimized intrusiveness and protected the proprietary or national security concerns of the home State.

3. Production equipment inspection

Using the CW indicators identified above, buildings were selected for inspection. Only two areas were found to contain chemical process equipment. One was used for manufacture of iron carbonyl and the other for rocket propellant. The iron carbonyl facility was inspected and no CW production capability was observed. Access to the propellant area was denied because of safety and cost (shutdown would have been required). However, the inspection team was assured that access would have been permitted in a real challenge inspection.

All the old production areas were entered and inspected. Four buildings were challenged as having some of the characteristics of a possible chemical plant; i.e., high bay, exterior tankage, taller than normal stacks, etc. One of these buildings was also enclosed in a separate security area. However, after receiving access it was easily determined that one of them was the power generating station and the rest were facilities involved in the testing of various rocket motor components.

Access to only two buildings (enclosed with concertina wire fencing) was denied with no reservations. Denial was based on a need to protect national security information. The inspection team was allowed to walk around he facilities and sampling would have been permitted. The buildings did not appear to be production facilities but could have been used to store CW. This was noted by the inspection team. In subsequent discussions, the home team pointed out that inspection after extensive shrouding may have been possible. However, the shrouding would have taken several days which may have been prohibitive for a challenge inspection.

4. Storage facility inspection

As indicated previously 80 storage buildings were selected for inspection. There were various reasons expressed by the home team why access to some could not be permitted which are listed as follows:

- there were explosives present (in the building or in the area);

  there were other hazardous materials present (residual chemical or environmental);

- there was a possible radiation hazard;

- they would have to shroud sensitive items present; and

- they would have to shroud proprietary information.

The inspection team must be prepared to deal with each of these situations which are legitimate excuses and take extra time. Shrouding is an uncontrollable parameter and alternatives must be offered to avoid excessive delays in the inspection. If there is a possibility of chemical or environmental hazards, the inspectors will require protective clothing which will have to be brought along or provided by the host State. Inspectors may prefer to bring their own protective outfits, but it may require local support (e.g., compressed air). It is apparent that gaining access to the storage areas will be tedious and time consuming.

Once access has been obtained, using the statistical sampling plan, sample munitions will be identified, marked and removed from the storage area to a work area. This is necessary because there is no in-place methodology for assessing whether a munition is CW. This is another labor intensive operation. If the munition selected is part of a unit or pallet of six or eight other munitions, the pallet must be disassembled to remove the

selected sample. In performing these operations at Redstone Arsenal, it took about one hour to don protective clothing (brought by the inspection team), enter the selected bunker, go to the randomly selected coordinates to identify the randomly selected munition, tag the munition and remove the munition to the work area. Obtaining the 80 sample munitions would have taken over three days, working 24 hours per day.

It was noted during the inspection that the bunkers were approximately 10 percent filled. Thus, the initial estimate for the number of munitions within the stockpile was excessive. A munition stockpile of 90 percent less size would only require eight munitions to be sampled. In a real situation, after obtaining the corrected size of the stockpile, the eight munitions to be sampled would be randomly selected from the 80 munitions previously tagged.

5. Munition inspection

If a munition is of concern or suspected of being a chemical round, it has been presumed that the host State must prove that the munition is not chemical. This could be done by many destructive methods (i.e., cutting, drilling, firing, exploding). All are hazardous, polluting and destructive procedures. At present, the stethoscope method was used to detect a sloshing liquid when the munition is rocked. This was only marginally satisfactory, as some of the chemical agents may be solids or viscous liquids or below the melting point. In addition, if the contents of the munition are proven to be a liquid, it still may not be CW (e.g., white phosphorus, an incendiary).

No chemical munitions were found during this exercise. Overall, the approach of randomly selecting munitions and bunkers seemed to work reasonably well. The question of how to assess the selected munition is open. The need for an in-place nondestructive test method is the predominant knowledge gap requirement. Also, the inspectors must be able to inspect munitions and determine whether they are CW or not without exposing sensitive weapons technology. However, even with such a method or device, the ultimate responsibility to demonstrate that a suspect round is not CW resides with the inspected party.

6. Records audit

The facility officials were questioned on whether records existed on the disposition of the old production equipment. They indicated that such records would be difficult to find. They referenced some of the publications which show that operations were stopped at the end of World War II. Equipment was decontaminated and disposed of. Much of the equipment was buried in what are identified today as contaminated

areas. Demilitarization and disposal of CW munitions and equipment was completed in 1955.

7. Sampling and detection

No samples were taken and no detection equipment was brought to Redstone Arsenal for this inspection. Sampling at the arsenal boundary would have had little relevance because it would be miles from the operating areas. Also this arsenal was the site of CW operations in World War II and still has 17 identified contaminated areas. It is believed that sampling would only have been effective at the exterior of several facilities where access was denied. The presence of chemical agent residues or hydrolysis products could have been the basis for an allegation concerning the facility. It would place the burden on the host State to provide further information or limited access to avoid an ambiguity.

8. Securing the site

A site the size (50 square miles) of Redstone Arsenal is extremely difficult to totally secure. Several public highways run through the installation and there are thousands of buildings and hundreds of storage bunkers of concern. Negotiations were conducted to seal some gates (simulated) and allow a roving patrol to monitor the main gates and storage areas. This would preclude the movement of a significant quantity of munitions. The facility officials also agreed to notify the inspection team when any vehicle of five ton capacity or larger was to leave the arsenal. This would provide the team with the opportunity to inspect the contents. However, it was apparent that an inspection team of ten was inadequate to inspect and control a site of this size.

9. The inspection team

The exercise demonstrated the need for experienced multidisciplinary inspection teams. There was a need for chemical processing, analytical chemistry, munitions design and storage, chemical detection and statistical analysis experience. There was the need for enough "depth" on the team to provide for dividing into subteams to cover such a large, diverse site. The team had to be knowledgeable in individual protection and safety around chemical agents, explosives and a variety of munitions. It would have required a team of at least 15 people and 7 days of inspection to adequately inspect a site of this size and complexity. (This estimate does not include interpreters if necessary.) Most of the inspection time was required for the storage area.

10. The challenging State observers

The challenging State observers duties were to observe that the inspection team inspected the areas of concern as defined in the challenge and that the mandate of the Technical Secretariat was executed. As part of this exercise, the observers were also requested to determine how much non-CW information they could gather. Their report indicated extra information was volunteered, some locations were visited longer than necessary and more shrouding could have been used.

11. Confidentiality

As indicated above, national security and proprietary information is vulnerable and must be protected in a challenge inspection. From the host State point of view, confidentiality must be the paramount consideration. However, the concerns of the allegations must be addressed. The host State representatives, the facility officials and the escorts must be aware at all times that loss of information is possible. They must take appropriate measures to shroud sensitive items or equipment, but they must be prepared to offer alternative methods of inspection to demonstrate compliance.

12. Areas requiring further work

This inspection has continued to make clear the need to conduct additional trial inspections to test each regime and monitoring aspect of the planned convention. Trial inspections at government installations as well as in the chemical industry must be conducted to determine how best to conduct an inspection and how best to protect both national security and proprietary information.

A need exists for the development or identification of sensitive, portable analytical equipment which can be brought with the inspection team and operated on-site during an inspection.

A need exists for the development of nondestructive testing equipment to distinguish between CW munitions and conventional munitions. It would greatly expedite the inspection if the testing could be done without removing the munitions from the bunker.

Statistical sampling plans vary with confidence levels and assumptions about significant quantities. Criteria for both of these items need to be developed and with consideration of time, environmental and regulatory constraints.

While procedures need to be flexible to allow for negotiations and individual site circumstances, provisions for

challenge inspections need to be contained in an inspection protocol to establish basic rights and responsibilities to minimize the amount of negotiation at the beginning of each inspection. For example, responsibilities and obligations of the host State and inspectors with respect to photography, sampling, site maps, access to documents, etc., should be specified. Negotiations at the site would then focus on site specific issues.

A protocol needs to be developed which would resolve ambiguities arising from shrouding. This protocol must clearly allay the concerns of the challenging State while protecting the national security and proprietary concerns of the host State.

D. CONCLUSIONS

With respect to the challenge, no capability to produce CW and no CW munitions were found.

The table-top exercises which were employed for several of the elements of this challenge inspection were completely satisfactory. This method allowed elements which had not been exercised previously to be tested with all of the participants. Much knowledge was gained with little expenditure of funds and no equipment requirements.

Good quality maps for both the inspection team and home team assisted by a facility official are essential to negotiations of a perimeter at the POE of the challenged State. The challenge should describe and specify in a site diagram with geographic coordinates the areas of concern and the site perimeter desired.

Negotiations on access within the perimeter are best conducted after a tour of the site.

Presence or absence of chemical production equipment is the most important aspect of determining the capability to produce Schedule 1 chemicals.

Shrouding equipment and displays is a useful alternative to preclude intrusiveness and satisfy the verification requirements of a challenge inspection. Limited access (within the doorway of a facility) enables the presence or absence of production capabilities to be confirmed in most instances.

Statistical sampling of storage bunkers and munitions appears to be a satisfactory method to identify munitions for inspection. A reliable method of nondestructive testing to determine if the munition is CW or not is urgently needed.

Securing a site the size of Redstone Arsenal by patrolling the perimeter is impractical. Alternatives, including a roving patrol, closing some exits and monitoring the open exits, may be effective in preventing or detecting the moving/shifting of prohibited materials during an inspection.